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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/622,966	07/18/2003	Michael Stanley DeCourcy	A01398	4021

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EXAMINER	
PRICE, CARL D	

ART UNIT	PAPER NUMBER
3749	

DATE MAILED: 09/19/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/622,966	DECOURCY ET AL.	
	Examiner	Art Unit	
	CARL D. PRICE	3749	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 July 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7,8-10* are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7,8-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Request for continued examination under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on **07/18/2006** has been entered.

Response to Arguments

Applicant's arguments with respect to claims **1-4, 6** and **8-10,** have been considered but are moot in view of the new ground(s) of rejection.

Applicant has amended the claims to be of a scope not previously considered. Consistent with applicant's argument that the prior art relied on in the previous office action fail to show, disclose and/or teach certain aspects of applicant's invention now recited in the claims filed on **07/18/2006,** applicant has amended the claims to include the following:

The examiner disagrees with applicant's argument that the abatement step in **US003977832 (SCHOFIELD)** is not the same as applicant's step of incinerating the preheated waste stream. As stated previously, the combustion heater (31) and catalytic combustor (35) of **US003977832 (SCHOFIELD)** are deemed to be the structural and functional equivalent to applicant's claimed "incineration apparatus". That is, the combustion heater (31) and catalytic combustor (35) of **US003977832 (SCHOFIELD)** result in the step of producing a deceased amount of thermal nitrogen **"oxides",** by converting these nitrogen oxides to innocuous gas by reduction to elemental nitrogen, in the same manner broadly set forth in applicant's claims. Applicant is reminded that **US003977832 (SCHOFIELD)** is relied on as for that which it would have taught a person having ordinary skill in the art at the time of the invention. That is, it would have been obvious to a person having ordinary skill in the art to treat a cooled mixed gas process

stream by directing the hot mixed gas stream through a heat exchanger system to form a preheated waste gas stream which is then passed through an incinerator or abatement unit to bring about a deceased amount of thermal nitrogen **"oxides",** by converting these nitrogen oxides to innocuous gas by reduction to elemental nitrogen. And, **US003977832 (SCHOFIELD)** as well as the newly cited **US007062912 (Penfornis et al),** teach that it would have been obvious to a person having ordinary skill in the art to reduce or lessen the amount of fuel in a combustor when the fuel and/or oxygen-containing stream is preheated. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant's attention is directed to the prior art teaching of **US005725366** and **US005823760** which, while not relied on in the rejection of the claims, teach that it would have been obvious to a person having ordinary skill in the art to reduce or lessen the amount of fuel in a combustor when the fuel and/or oxygen-containing stream is preheated. **US005725366** teaches that the use of preheated fuel produces reduced NOx emissions in the presence of nitrogen, improves the rate of heat transfer from the resulting flame to a load being processed, and reduces heat losses resulting from the ejection of high temperature flue gases from the combustion process. **US005823760** teaches that preheating reduces the amount of heat which subsequently must be added to raise the temperature of air, and thus reduces the amount of fuel that must be burned.

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the ***"a shell and tube exchanger configured to ensure that each constituent of the hot mixed gas stream remains above the respective constituent's melting point"(claim 6), "wherein the preheated waste stream is incinerated, at least in part, by preheating the supplemental fuel" (claim 9), "wherein the preheated waste stream is incinerated, at least in part, by preheating the oxygen-containing***

stream" (claim 10) must be shown or the feature(s) canceled from the claim(s). **No new matter should be entered.**

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1 and 2 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites two occurrences of the limitation "a heat exchanger system" (two occurrences). There is insufficient antecedent basis for this limitation in the claim. It is suggested applicant distinguish between the two recitations of "a heat exchanger system" by associating terms such as - - -first - - and - -second - - with "a heat exchanger system".

Claim 2 is vague and indefinite since it is unclear which "a heat exchanger system" (i.e. – "from another process stream"(claim 1) or "the same process stream" (claim 2) necessarily makes up the invention. It is suggested applicant recite, in claim 1 (section 1d), - - producing a preheated waste stream by directing the cooled waste stream through one of said first heat

exchanger system which transfers thermal energy to the waste stream and a second heat exchanger system which transfers thermal energy to the waste stream - -.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims: Rejected under 35 U.S.C. 103(a)

Claims **1-4** and **8-10** are rejected under 35 U.S.C. 103(a) as being unpatentable over the conventional industrial processes disclosed by applicant on pages 1-2 of the specification (Referred to hereinafter as "**Conventional Acrylic Acid Industrial Processes**") in view of **US003977832 (SCHOFIELD)** and **US007062912 (Penfornis et al)**.

The **Conventional Acrylic Acid Industrial Processes** disclosed by applicant comprise:

> "Methods of making products such as acrylic acid from propylene, a reaction feed mixture, typically comprising propylene, oxygen, and optionally water, or nitrogen or other inerts. A two-stage catalytic reactor is typically utilized to oxidize the propylene to acrolein in a first reactive stage, and to then oxidize the acrolein to acrylic acid in a second reactive stage. Conventional two-stage reactors may comprise, for example, a single-shell reactor system (an "SRS"), a tandem reactor system, or a staged-air tandem reactor system, all of which are well known to those skilled in the art.

> The output from the catalytic reactor is a hot mixed gas stream comprising acrylic acid, unreacted propylene, nitrogen, and other impurities, such as water, carbon monoxide, carbon dioxide, and acrolein. The hot mixed gas stream passes into a separation step, which serves to separate the acrylic acid from the impurities.
>
> Conventional separation steps typically comprise equipment such as absorbers or extraction columns. The separation step produces at least two streams: a crude product stream comprising primarily acrylic acid, and a waste stream comprising primarily impurities.
>
> The crude product stream is typically further processed to produce product grade acrylic acid or other products, such as acrylic acid esters. The waste stream is typically fed to an incineration step, along with supplemental fuel, such as natural gas, and an oxygen-containing gas stream, such as atmospheric air or oxygen-enriched air. The incineration step typically comprises processing equipment such as thermal oxidizers, incinerators, furnaces, or other combustors suitable for providing high-efficiency destruction of waste streams. In the incineration step, the waste stream is combusted or thermally decomposed to create an effluent stream, comprising inerts - such as water and carbon dioxide - and also thermal NOx. Examples of conventional processes for producing acrylic acid can be found in U.S. Patent Nos. **5,817,865; 6,166,248;** and **6,350,906**."

That is, the **Conventional Acrylic Acid Industrial Processes** include the steps of:

- producing a crude acrylic acid comprising a hot mixed gas stream by feeding a reaction feed mixture through an inlet of a reaction vessel, and passing the reaction product through an outlet of the reaction vessel;
- separating the mixed gas stream e.g. – in a separator column) into a crude product stream and a waste stream;
- incinerating the preheated waste stream by directing it into an incinerator along with supplemental fuel and oxygen-containing streams, wherein the gaseous emissions comprise at least one of the following: nitrogen dioxide, nitric oxide, and carbon monoxide.

The **Conventional Acrylic Acid Industrial Processes** disclosed by applicant include the steps of applicant's claimed method with possible exception to:

- producing a cooled mixed gas stream by directing the hot mixed gas stream through a heat exchanger system to form a preheated waste gas stream; and
- "preheated" supplemental fuel.

- "preheated" oxygen-containing stream.

US003977832 (SCHOFIELD) teaches, from applicant's same combustion field of endeavor, a method for reducing the emission of gaseous products into the atmosphere.

US003977832 (SCHOFIELD) discloses a method for reducing the emission of gaseous products into the atmosphere:

> "(8) The total effluent from heater 31, in addition to the added steam and products of fuel combustion, will contain oxides of nitrogen (NOx) which are deleterious both from the standpoint of their effect on the turbine parts as well as their pollution on discharge to the atmosphere. It is therefore common practice to convert these nitrogen oxides to innocuous gas by reduction
> to elemental nitrogen. Such reductions of NOx in the gas stream discharged from 31 is carried out by catalytic combustion in a NOx abatement unit 35, wherein the gas is treated with a suitable reductant, such as natural gas or other hydrocarbon fuel, admitted thereto by line 36."

The method of **US003977832 (SCHOFIELD)** includes the steps of:

a. producing a reaction product comprising a hot mixed gas stream (not referenced) by feeding a reaction feed mixture through an inlet of a reaction vessel (20), and passing the reaction product through an outlet of the reaction vessel;

b. producing a cooled mixed gas stream (at 21, 22 and 23) by directing the hot mixed gas stream through a heat exchanger system;

In this regard **US003977832 (SCHOFIELD) discloses**:

> "(4) Air stream 14, as illustrated, is subdivided into several branch streams designated 15, 16, and 17, respectively. Stream 15 furnishes the air used an oxidation of ammonia. Thus, stream 15 is admixed with ammonia introduced by line 18 into catalytic converter 20, in which the initial oxidation takes place over known noble metal catalyst, forming oxides of nitrogen, chiefly NO. The gas stream of reaction products from converter 20 is passed through a waste heat boiler 21 in which the stream is initially cooled, and then through a heat exchanger 22 and cooling condenser 23, for further lowering of the temperature prior to admission of the thus cooled gas stream in absorber tower 24.

> (5) Water is admitted to absorber 24 by a supply line 25. As the NO-containing gas stream is successively cooled at 21, 22 and 23 in the presence of excess oxygen, at least the major portion of the NO is converted to NO_2..."

c. separating the cooled mixed gas stream into a cooled crude product stream (26) and a cooled waste stream (27);

d. producing a preheated waste stream (30) by directing the cooled waste stream through the heat exchanger system (22); and

e. incinerating the preheated waste stream by directing it into an incinerator (35); and

- wherein separation of the cooled mixed gas stream into the cooled crude product stream and the cooled waste stream comprises passing the cooled mixed gas stream into a separator column (24);
- wherein the gaseous emissions comprise at least one of the following: nitrogen dioxide, nitric oxide, and carbon monoxide;
- wherein the preheated waste stream is incinerated through the use of a preheated supplemental fuel and a preheated oxygen-containing stream produced in heater (31).

The combustion heater (31) and catalytic combustor (35) of **US003977832 (SCHOFIELD)** are deemed to be the structural and functional equivalent to applicant's claimed "incineration apparatus". That is, the combustion heater (31) and catalytic combustor (35) of **US003977832 (SCHOFIELD)** result in the step of producing a deceased amount of thermal nitrogen **"oxides",** by converting these nitrogen oxides to innocuous gas by reduction to elemental nitrogen, in the same manner broadly set forth in applicant's claims. In this regard applicant's attention is directed to **US003977832 (SCHOFIELD)** which states the following:

> (6) **With the application of stricter standards on fume abatement** and to protect the turbine blades from corrosion by the tail gas, it has been the practice to purify the gas prior to introducing the same into the turbines or discharging to the atmosphere. **This can be accomplished by passing the preheated tail gas over a noble metal catalyst in the presence of a reductant,** such as a

> hydrocarbon fuel, **which reduces the NOx in the tail gas to innocuous elemental nitrogen** while residual oxygen in the gas stream is consumed by combustion of the hydrocarbons to form CO.sub.2 and water. **Since additional sensible heat is thus released in the NOx abatement unit,** the additional energy thus made available is beneficially utilized in supplying power for operation of the gas expansion turbines.
>
> (8) The total effluent from heater 31, in addition to the added steam and products of fuel combustion, will contain oxides of nitrogen (NOx) which are deleterious both from the standpoint of their effect on the turbine parts as well as their pollution on discharge to the atmosphere. **It is therefore common practice to convert these nitrogen oxides to innocuous gas by reduction to elemental nitrogen.** Such reductions of NOx in the gas stream discharged from 31 is carried out by catalytic combustion in a NOx abatement unit 35, wherein the gas is treated with a suitable reductant, such as natural gas or other hydrocarbon fuel, admitted thereto by line 36. If available and so desired, the reductant hydrocarbon fuel admitted to abatement unit 35, may be supplemented with hydrogen containing off gas. Abatement unit 35 contains noble metal or other suitable catalyst promoting the desired reduction of NOx. In unit 35 also, **remaining oxygen in the gas stream from heater 31** is consumed in combustion of the hydrocarbons and any free hydrogen to CO.sub.2 and water. As a result of the several reactions taking place in unit 35 the temperature of the gas is further increased, and is then discharged through line 37 into the expansion gas turbine 11 driving the third stage air compressor 10 of system 2. The discharge gas from turbine 11 passes successively through turbines 8 and 4, and is finally discharged to stack through line 40.

US007062912 (Penfornis et al) teaches, from applicant's same combustion field of endeavor, preheating a fuel and/or a oxygen-containing stream results in lessening the amounts of oxidant and fuel gases necessary for combustion than would otherwise be achievable in absence of preheating.

US007062912 (Penfornis et al) discloses the following:

> (14) The flow of oxidant gas 3 and a flow of fuel gas 9 are directed towards heat exchanger system 11. Examples of fuel gas include, but are not limited to, natural gas, other gaseous hydrocarbons, and mixtures thereof. At heat exchanger system 11, **either one or both of the flows of oxidant and fuel gases 3, 9 are preheated** by heat exchange with a flow of flue gas 13 exiting a furnace 15 to a temperature that allows safe operation of the heat exchanger. Following the heat exchanger system 11, the flows of oxidant and fuel are directed towards the furnace 15 where they are combusted. **Preheating** of at least one of the oxidant and fuel gas flows 3, 9 **raises the amount of thermal energy introduced into the furnace 15. As a result, lesser amounts of oxidant and fuel gases may be**

combusted to reach an energy input to the furnace 15 and a heat input to load 17 **than would otherwise be achievable in absence of preheating** through heat exchange with the flue gas.

In regard to claims **1-4** and **8-10,** for the purpose of reducing the emission of gaseous products into the atmosphere, it would have been obvious to a person having ordinary skill in the art to modify a **Conventional Acrylic Acid Industrial Process** to include a cooled mixed gas stream by directing the hot mixed gas stream through a heat exchanger system to form a preheated waste gas stream passed through an incinerator or abatement unit bringing about a deceased amount of thermal nitrogen **"oxides"** by converting these nitrogen oxides to innocuous gas by reduction to elemental nitrogen, in view of the teaching of **US003977832 (SCHOFIELD).** In addition, for the purpose of raising the amount of thermal energy introduced into the furnace to thereby lessen the amounts of oxidant and fuel gases necessary for combustion than would otherwise be achievable in absence of preheating, it would have been obvious to a person having ordinary skill in the art to modify a **Conventional Acrylic Acid Industrial Process** to incinerate the preheated waste gas stream along with a preheated supplemental fuel and a preheated oxygen-containing stream in, necessarily reducing or lessening the amount of fuel otherwise necessary for combustion without preheating, in view of the teaching of **US003977832 (SCHOFIELD),** as supported by **US007062912 (Penfornis et al).**

Claims: Rejected under 35 U.S.C. 103(a)

Claim **6** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Conventional Acrylic Acid Industrial Processes** in view of **US003977832 (SCHOFIELD)** and **US007062912 (Penfornis et al),** as applied to claim 1 above, and further in view of **US004230669 (EAGLE et al).**

The **Conventional Acrylic Acid Industrial Processes** disclosed by applicant include the steps of applicant's claimed method with possible exception to:

- a shell and tube exchanger comprising a shell portion and a tube portion, and a series of disk-shaped and donut-shaped baffles.

US004230669 (EAGLE et al) teaches, form the same industrial processes and heat exchanger field of endeavor as **Conventional Acrylic Acid Industrial Processes** and **US003977832 (SCHOFIELD)**, using a shell and tube exchanger as a suitable means for transferring useful heat from one process stream to a second process stream.

In regard to claim **6**, for the purpose of providing a suitable means for transferring useful heat from the hot mix process stream to the waste stream, it would have been obvious to a person having ordinary skill in the art to use a shell and tube exchanger, in view of the teaching of **US004230669 (EAGLE et al).** Furthermore, in order to prevent undesirable solidification of any constituent of the product stream, the hot process stream would necessarily be maintained above the respective constituent's melting points. Thus, as an obvious design expedient, it would have been obvious to a person having ordinary skill in the art to configure the heat exchanger to maintain the respective constituent's of the hot gas stream above their melting points. Additionally, since the arrangement of a given heat exchanger would necessarily depend on numerous design concerns such as the overall size and shape of the process system components, the type of material being processed or produced, the amount of material being produced, etc. to for example arrange a series of disk-shaped and donut-shaped baffles disposed within the shell and tube exchanger's shell portion in the manner set forth in applicant's can be viewed as nothing more than a mere matter of choice in design absent the showing of any new or unexpected results produced therefrom over the prior art of record.

Conclusion

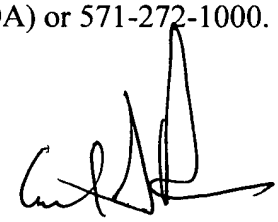
See the attached USPTO for, 892 for prior art made of record and not relied upon which is considered pertinent to applicant's disclosure.

USPTO CUSTOMER CONTACT INFORMATION

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CARL D. PRICE whose telephone number is (571) 272-4880. The examiner can normally be reached on Monday through Friday between 6:30am-3:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ehud Gartenberg can be reached on (571) 272-4828. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



CARL D. PRICE
Primary Examiner
Art Unit 3749

CP